

An algorithm of rehabilitation examination of persons with Charcot-Marie-Toot disease

Iryna Korman

Lviv State University of Physical Culture, Lviv, Ukraine

The Charcot-Marie-Toot disease is a hereditary demyelinated polyneuropathies, accompanied by a complex of physical and functional disorders from the musculoskeletal and nervous systems.

Purpose: to develop an algorithm for the rehabilitation examination of persons with Charcot-Marie-Toot's disease.

Material & Methods: theoretical analysis and generalization of data from scientific and methodological literature and the worldwide Internet information network, classification.

Result: algorithm of rehabilitation examination is offered that will allow fully covering the existing violations and objectively assessing the physical and functional state of the patient for this disease is proposed.

Conclusion: carrying out a comprehensive rehabilitation survey and analyzing its results is the basis for an adequate selection of means and methods of physical rehabilitation and building a rehabilitation intervention plan.

Keywords: algorithm of examination, physical rehabilitation, Charcot-Marie-Toot disease.

Introduction

Since, to date, medical treatment of this nosology does not lead to a slowing or stopping of the progression of this disease, most modern studies point to physical rehabilitation as a necessary means of treatment [4; 6; 8]. Presence of complex violations of the functional state of the musculoskeletal system in this disease, the progressivity of their passage and the decrease in the quality of life of persons with this disease determine the urgency of individualization of physical rehabilitation [3; 7]. Objective study of motor and functional disorders in the Charcot-Marie-Toot disease will allow to establish a rehabilitation diagnosis, which in future will be the basis for creating an individual rehabilitation program.

Relationship of research with scientific programs, plans, themes. The chosen direction of research corresponds to the theme of research work in the field of physical culture and sports for 2011–2015. Ministry of Ukraine for Family, Youth and Sports on theme 4.2. "Physical rehabilitation with disruption of the musculoskeletal system" (state registration number 0111U006471).

Charcot-Marie-Toot disease is the most common among hereditary neuropathies [9]. However, to date, therapeutic options for this disease are limited to symptomatic treatment, and the most effective treatment for this nosology is physical therapy [4; 5; 7].

Primary component of the activity of a physical rehabilitation specialist is a rehabilitation survey to identify existing violations on the part of various systems, which is necessary for establishing a rehabilitation diagnosis, planning and forecasting the process of physical rehabilitation [1].

Physical rehabilitation program must take into account all the functional and motor impairments that exist, the features of the initial physical condition and the concomitant diseases. A thorough examination of the patient and the establishment of

his rehabilitation diagnosis is the basis for building a rehabilitation program [2; 8].

Existing research in the field of physical rehabilitation, in particular, the rehabilitation examination of people with Charcot-Marie-Toot's disease, does not fully cover this issue. However, it should be noted that the effectiveness of the rehabilitation program and the individual approach to selecting the means and methods of intervention primarily depends on an integrated and objective examination of the patient.

Purpose of the study: to develop an algorithm for the rehabilitation examination of persons with Charcot-Marie-Toot's disease.

Material and Methods of the research

Research methods: theoretical analysis and generalization of data from scientific and methodological literature and the world information network Internet; induction and classification.

Results of the research and their discussion

It is necessary to pay attention to the fact that in the clinical activity of the physical rehabilitation specialist, before starting the preparation and implementation of the rehabilitation program, it is necessary to establish a rehabilitation diagnosis; accordingly, for this he needs to conduct a survey [2].

In order for the rehabilitation survey to fully cover all existing disorders of the musculoskeletal system and be comprehensive and objective, it should include the following components: observations, objective evaluation and subjective evaluation [2].

When examining people with Charcot-Marie-Toot disease, taking into account the typical disorders of the disease, such as: hypotrophy of the muscles of the distal lower and upper

extremities, deformities of the hands and feet, disorders of walking and balance, and others, it is also necessary to include the above components [3; 5; 9]. That is why when examining people with this polyneuropathy, we suggest adhering to the algorithm developed by us (Figure).

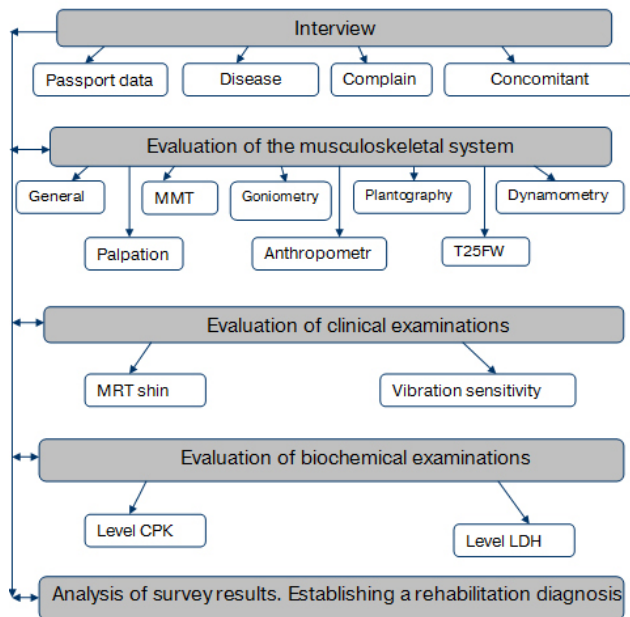


Fig. Algorithm of rehabilitation examination of people with Charcot-Marie-Toot disease:

MMT – manual muscle testing, MRT – magnetic resonance tomography, CPK – enzyme level creatine phosphokinase, LDH – level lactic dehydrogenase, T25FW – timed 25-Foot Walking – walking test [10].

Algorithm of rehabilitation examination for people with Charcot-Marie-Toot's disease provides for the consistent application of such components of the survey as: survey, assessment of the musculoskeletal system, assessment of clinical examinations, assessment of biochemical examinations, the analysis of which will be the basis for establishing a rehabilitation diagnosis and compiling an individual and constructive program for physical rehabilitation.

Interview includes the patient's complaints, both basic and additional, the medical history, and presence of concomitant diseases. It is important to pay attention to the age of the individual, the date of diagnosis and the period of manifestation of the disease, which will allow us to analyze the rate of progression of polyneuropathy.

Evaluation of the musculoskeletal system include in itself:

– general surveying and palpation. During examination, attention should be paid to the condition of the skin, the deformation of the feet and hands and the state of their severity, the presence of distal muscular hypotrophy and body positions. When palpation, pay attention to the consistency of the muscles of the lower and upper extremities, especially the distal muscle groups.

– manual muscle testing – allows to establish the presence of weakness of the muscle or group of muscles, namely – flexors and extensors of the foot, hip, leading and withdrawing muscles of the hip, flexors and extensors of the hand and in the

future adequately pick up the load for training the weakened muscle or group of muscles.

– goniometry is performed to detect the violation of the amplitude of motion in the ankle, knee, hip and radial-wrist joints. Conducted contralaterally.

– anthropometric measurements allow to determine the presence and extent of limb hypotrophy by measuring the centimeter band of the circumference of both shins, the upper third of the thigh, the forearm.

– plantography – allows to determine the degree of deformability of the foot due to the determination of the state of the arches (transverse and longitudinal), the presence or absence of additional x load points.

– dynamometry – allows us to assess the weakness of the muscles of the hand and forearm, necessarily measured contralaterally.

– timed 25-Foot Walking – a walking test is proposed that will allow an objective and functional evaluation of the condition of the musculoskeletal system. At runtime, in addition to the time of the test, we also pay attention to the quality of walking, the number of stops [10].

For an objective assessment of functional disorders on the part of various systems, modern informative research methods. That is why the evaluation of clinical and biochemical studies allow compiling a complete and objective picture of the patient's disorder and condition:

– analysis of the results of the magnetic resonance tomography of the shins is an objective assessment of the condition of the muscles, which further allows for maximum individualization of the physical rehabilitation program and predict its effectiveness in accordance with the patient's initial condition;

– analysis of the results of vibration sensitivity – will allow to assess violations of deep sensitivity and take into account this factor in the selection of the load;

– analysis of the results of biochemical studies in particular, the level of enzymes CPK (creatine phosphokinase) and LDH (lactate dehydrogenase) will provide information on the internal state of the muscles and their response to physical stress, both routine and specially selected.

Conclusions

Based on the above, we can conclude that to effectively overcome existing physical, functional disorders and preserve the function of the limbs, to prevent early disability of people with Charcot-Marie-Toot's disease, you must follow the developed algorithm of rehabilitation examination. This will allow us to identify various violations on the part of various systems of the body, take into account the individual characteristics of patients.

Prospect for further research. Comprehensive rehabilitation examination is the basis for the creation of an individual physical rehabilitation technique for individuals with Charcot-Marie-Toot disease, which would allow optimal resolution of existing motor and functional disorders.

Conflict of interests. The author declares that no conflict of interest.

Financing sources. This article didn't get the financial support from the state, public or commercial organization.

References

1. Boichuk, T., Holubieva, M., Levandovskiy, O. & Voichyshyn, L. (2010), *Osnovy diahnostychnykh doslidzhen u fizychnii reabilitatsii: navch. posib. dlia stud. VNZ* [Fundamentals of Diagnostic Research in Physical Rehabilitation: Teach. Manual For the stud Higher Educational Institutions], ZUKTs, Lviv. (in Ukr.)
 2. Hertsyk, A.M. (2007), "Structure of the procedure of inspection of the locomotor apparatus in physical rehabilitation", *Pedahohika, psykholohiia ta medyko-biologichni problemy fizychnoho vykhovannia i sportu*, No. 9, pp. 23-25. (in Ukr.)
 3. Korman, I. & Semeriak, O. (2016), "Hereditary Sensor Motor Neuropathy of Sharko-Mari-Tut: Ethio-pathogenesis and Features of the Functional Condition of the Musculoskeletal System", *Fizychna kultura, sport ta zdorov'ia natsii: zb. nauk. prats, Vyd-vo FOP Yevenok O. O.*, Zhytomyr, Vyp. 2, pp. 277-281. (in Ukr.)
 4. Corrado, B., Ciardi, G. & Bargigli, C. (2016), "Rehabilitation Management of the Charcot-Marie-Tooth Syndrome: A Systematic Review of the Literature", *Medicine (Baltimore)*, No. 95(17), pp. e3278, doi: 10.1097/MD.0000000000003278.
 5. McCorquodale, D., Pucillo, E.M. & Johnson, N.E. (2016), "Management of Charcot-Marie-Tooth disease: improving long-term care with a multidisciplinary approach", *JMultidiscipHealthc*, No. 9, pp. 7-19, doi: 10.2147/JMDH.S69979.
 6. Nakagawa, M. (2014), "Diagnosis and care of Charcot-Marie-Tooth disease", *RinshoShinkeigaku*, No. 54(12), pp. 950-2, doi: 10.5692/clinicalneuro.54.950. (in Jap.)
 7. Young, P., De Jonghe, P., Stugbauer, F. & Butterfass-Bahloul, T. (2008), "Treatment for Charcot-Marie-Tooth disease", *Cochrane Database Syst Rev*, No. 23(1), pp. CD006052, doi: 10.1002/14651858.CD006052.pub2.
 8. Watanabe, K. (2016), "Treatment for Patients with Charcot-Marie-Tooth Disease: Orthopaedic Aspects. BrainNerve", No. 68(1), pp. 51-7, doi: 10.11477/mf.1416200345. (in Jap.)
 9. Charcot-Marie-Tooth Association (2017), Official website, available at: <http://www.cmtausa.org/resource-center/treatment-management/> (accessed 22 July 2017).
 10. Everyday Health Media, LLC (2016), A Simple Walking Test Tracks MS Progress, available at: <http://www.everydayhealth.com/multiple-sclerosis/treatment/simple-walking-test-tracks-ms-progress/> (accessed 22 July 2017).
- Received: 18.07.2017.
Published: 31.08.2017.

Information about the Authors

Iryna Korman: Lviv State University of Physical Culture: Kostushko str. 11, Lviv, 79000, Ukraine.

ORCID.ORG/0000-0002-0332-6132

E-mail: iraknopka7@gmail.com